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Canadian Atlantic Fisheries
Scientific Advisory Committee

CAFSAC Research Document 84/82

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Comité scientifique consultatif des
pêches canadiennes dans l'Atlantique

CSCPCA Document de recherche 84/82

White hake (Urophycis tenuis, Mitchill) status during 1983 in the southern Gulf of St. Lawrence

by

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ABSTRACT

White hake landings in NAFO division 4T during 1983 were down from the previous three years to a low of 8420 tonnes (provisional data). The drop in catch is thought to be a reflection of market conditions rather than a decrease in stock abundance.

Difficulties were encountered with past conventional criteria for sampling of fish due to the recent preference for headed/gutted hake by many fish processors. This has become wide spread in the past few years. The sampling criteria for white hake in the Gulf of St. Lawrence has been altered to allow the collection of head-off white hake. This will be done during 1984 by measuring the length from the leading edge of the first dorsal fin to the tip of the tail and subsequently converting to total length.

A comparitive aging study using otoliths and vertabrae of white hake collected during a research cruise (R/V E.E. Prince - P296) in 1983 gave similiar results.

RESUME

Les débarquements de merluche blanche dans la division 4T de l'OPANO au cours de l'année 1983 ont diminué par rapport aux trois années précédentes et n'ont atteint que 8 420 tonnes (données provisoires). On pense que cette diminution des prises reflète plutôt les conditions du marché qu'un amoindrissement du stock.

On a eu des difficultés avec les critères traditionnels pour l'échantillonnage des poissons, à cause de la nouvelle préférence que montrent de nombreuses entreprises de transformation du poisson pour la merluche étêtée/éviscérée. Cette pratique s'est répandue dans les dernières années. Les critères d'échantillonnage pour la merluche blanche dans le Golfe du Saint-Laurent ont été modifiés pour permettre l'inclusion de la merluche étêtée. Au cours de l'année 1984, on mesurera donc la merluche à partir du bord antérieur de la première nageoire dorsale jusqu'à l'extrémité de la queue, pour ensuite convertir cette mesure en longueur totale.

Une étude comparative sur les âges, faite au moyen des otolithes et des vertèbres de merluche blanche recueillis au cours d'une croisière de recherche par le navire de recherche E.E. Prince (P296) en 1983, a donné des résultats semblables.

103-02431/

INTRODUCTION

The white hake (Urophycis tenuis, Mitchill) fishery in the southern Gulf of St. Lawrence commences in May, peak landings occur between July and September and it declines through October and November. The fishery is carried out mainly by small inshore vessels making it extremely dependent upon weather and local market conditions. Winter ice coverage precludes fishing from December until April each year. The majority of the fishery is carried out in the Northumberland Strait area, and on both the eastern and western ends of P.E.I. This fishery tends to be carried out by tonnage class 0 and 1 vessels using two gear types. The first group use gillnets in the summer and, if the weather permits, long lines in the fall and the second group (>30% of the fishery), particularly that based in Nova Scotia, use small (<20m) draggers. The provisional catch in 1983 (Table 1) of 8420 tonnes is a drop of 9% over the 9170 tonnes catch of 1982 (Table 2). This fishery was not managed by a TAC until the precautionary quota of 12,000 tonnes was placed upon this stock in 1981.

Efforts are currently being made to develop markets for fresh white hake, however most of the catch is still being salted. Although difficulties in obtaining the traditional white fleshed species (eg. cod and haddock) have resulted in a new, active interest in Gulf hake stocks, the fishery is still largely limited by market problems.

SAMPLING

A total of 4520 fish were sampled from 11 ports in Nova Scotia and P.E.I. Otoliths were obtained from 803 of these fish. No white hake were sampled in New Brunswick, Quebec or Newfoundland.

A serious sampling problem has developed over the past two years. Processors are increasingly paying premium prices for head off, gutted fish. This results in serious sampling deficiencies as no length frequencies or age samples can be collected using historic sampling criteria.

In order to continue the white hake sampling program in light of this difficulty we have investigated three different relationships; total length versus an alternate length from the tip of the tail to the: 1) anus (vent), 2) 2nd dorsal fin, and 3) 1st dorsal fin. Each of these relationships was studied for goodness of fit, ease of measurement, and applicability to the processing commonly carried out by the "average" fisherperson at sea. These alternate length measurements were all done by reversing the fish on an offset meter board (tip of tail set at zero) and measuring to the nearest whole cm.

Anal length was measured to the nearest cm from the tip of the tail to the vent. This relationship was:-

$$TL = -6.92 + 1.91\ AL \quad ,$$

where TL is total length in cm and AL is the anal length in cm. This equation has the greatest variation of the three relationships. One source of this variation appeared to be due to the large size of the vent on spawning fish. Spawning takes place between June and September, coinciding with the peak in landings; this leads to a high degree of variability in measurements from fish in samples transformed by this equation.

The second and third relationships, the lengths to the 1st and 2nd dorsal fins were measured from the tip of the tail to the leading edge of the 1st or 2nd dorsal fins respectively. Both of these regression equations had less variation than the previous relationship, they are:-

1st dorsal length

$$TL = -0.24 + 1.30\ DL1,$$

where TL is total length in cm and DL1 is the first dorsal length in cm.

2nd dorsal length

$$TL = -2.06 + 1.55\ DL2 \quad ,$$

where TL is the total length in cm and DL2 is the second dorsal length in cm.

Attempts were made to define the position at which fisherpersons generally decapitated the hake in the dressing operation. Originally we were unsure as to the exact position of the cut made by the fisherpersons when removing the head, however after observing several thousands of fish which had been processed by many individuals it was confirmed that the cut (and in some cases a tear) is always anterior of the 1st dorsal fin. Therefore, the 1st dorsal fin to the tip of the tail measurement has been chosen for all subsequent sampling/ transformations of 'head off' white hake in the Gulf of St. Lawrence. This measurement is preferred to the other two choices, since its greater length (than the other alternate measurements) leaves it subject to less variance.

AGE AND GROWTH

The first aging of white hake in NAFO division 4T (Gulf of St. Lawrence) was carried out in 1981 on 1980 samples (Hunt, MS 1982). White hake were aged again in 1983/84 using the same general technique as outlined by Hunt. These fish came from the 1983 fall groundfish cruise (245 otolith pairs with matching vertebrae) and the commercial port samples (800 otolith pairs).

The first three unattached vertebrae were collected and stored frozen in labelled plastic bags. These bones were later boiled to remove the flesh and improve the contrast. The annuli were interpreted as the dark rings observed with reflected light. After boiling the rings were not as clear as rings observed on the vertebrae of some other species having higher levels of fat in the flesh, and were not as clear on dried, boiled vertebrae as they were on fresh 'uncleaned' ones. Otoliths were easier to process with regards the large scale collection systems currently used by D.F.O. in many fish plants. However, the total time required for sectioning and mounting them was about equal to that required to boil the vertebrae.

The age estimated from the vertebrae was similar to that estimated from the otoliths (Figure 1). Seventy eight percent of the otoliths and vertebrae were interpreted as having the same number of annuli while 13% gave higher and 9% gave lower otolith ages with respect to vertebrae. As a result of this close agreement, and because the otoliths are easier to collect and store, and as no more effort is required to prepare otoliths than vertebrae, it was decided to complete this aging study using otolith samples.

The results from this otolith aging investigation indicate similar growth patterns to those documented by Hunt (MS 1982). The mean length-at-age for NAFO division 4T white hake are:

ANNULI*	SEX	E.E. PRINCE RESEARCH CRUISE		
		P244 (1980)	P278 (1982)	P296 (1983)
3	male	33.7	31.9	32.8
	female	35.0	31.3	33.3
4	male	40.7	40.7	41.9
	female	39.2	41.6	43.4
5	male	48.2	48.3	50.7
	female	48.4	50.9	53.4
6	male	55.1	55.1	59.2
	female	57.0	59.5	63.2

* Annuli and age are synonomous for our interpretation.

The interpretation of annuli as age does vary between that suggested by Hunt (MS 1982) and the present study. In this paper we have taken the first ring, probably laid down between 6 and 8 months after spawning as

representing the first "annular increment" i.e. equal to age one. The formula for the yearly growth (age-at-length) from the 1983 fall groundfish cruise are:

$$\text{sex = combined} \quad TL\ cm = 12.146\ (AGE\ yr)^{0.9086} \quad ;r^2 = 0.83,\ N=245$$

$$\text{sex = male} \quad TL\ cm = 12.827\ (AGE\ yr)^{0.8535} \quad ;r^2 = 0.85,\ N=98$$

$$\text{sex = female} \quad TL\ cm = 12.057\ (AGE\ yr)^{0.9244} \quad ;r^2 = 0.82,\ N=146$$

and those for the 1982 fall groundfish cruise are:

$$\text{sex = combined} \quad TL\ cm = 20.034\ (AGE\ yr)^{0.6550} \quad ;r^2 = 0.80,\ N=257$$

$$\text{sex = male} \quad TL\ cm = 21.132\ (AGE\ yr)^{0.5956} \quad ;r^2 = 0.87,\ N=119$$

$$\text{sex = female} \quad TL\ cm = 19.288\ (AGE\ yr)^{0.6997} \quad ;r^2 = 0.76,\ N=138$$

The numbers of white hake caught in the fall groundfish cruise have varied between 150 and 400 fish. Such numbers preclude using the data as an abundance index, however there were approximately the same number of fish caught during the cruise in 1983 as in 1982 (258 to 270 respectively). The aged fish from these cruises can be used to indicate age composition in the population as shown below:-

PERCENT AGE-COMPOSITION (from fall groundfish surveys)

AGE	MALES			FEMALES			COMBINED		
	1980	1982	1983	1980	1982	1983	1980	1982	1983
3	7	8	19	7	8	16	7	8	17
4	10	20	29	14	20	18	12	21	22
5	21	20	20	29	24	26	25	24	24
6	31	14	9	27	17	18	29	16	15
7	21	12	8	13	19	10	17	16	9
8	6	11	3	8	5	5	7	8	4
9	3	10	3	2	4	2	2	4	2
10	-	1	2	-	1	2	-	1	2
11	-	-	-	-	1	-	-	2	-

The age composition indicates little if any difference between this year's population and that of the previous four years. The number of fish in the research vessel survey is the same (within 10%) as last years and is not greatly different (within the limitations of the data) from previous years. The percent age-composition does indicate some variability in the population from 1980 to 1983, however the sample size must be born in mind. (The combined population composition is not as variable as the sexed fequencies. The potential increase in recruitment at age 3 in 1983 was due

to 15 fish caught in the 1983 survey.) The drop in commercial landings can not be taken as an indication of a reduced biomass as very low prices for salt fish in 1983 have reduced the amount of effort put into the fishery during the fishing season.

There are little data to support any change in the 1983 recommended advice.

REFERENCES

Hunt,J.J. (MS1982) Age determination of white hake (Urophycis tenuis)in the Gulf of St.Lawrence. CAFSAC Res. Doc. 82/25. 16p.

Table 1. Nominal landings of white hake from NAFO division 4T in 1983 broken down by gear and month. All data are provisional statistics. Quebec data were not available on a monthly basis.

YEAR::GEAR	TRAWL	SEINE	LINE	GILLNET	OTHER	TOTAL
JANUARY	0	0	0	0	0	0
FEBRUARY	0	0	0	0	0	0
MARCH	0	0	0	0	0	0
APRIL	0	0	0	0	0	0
MAY	0	116	2	18	0	136
JUNE	148	283	51	377	0	859
JULY	734	238	7	883	0	1862
AUGUST	641	106	70	788	0	1605
SEPTEMBER	400	58	72	520	1521	2571
OCTOBER	192	75	65	179	0	511
NOVEMBER	11	32	299	115	141	598
DECEMBER	0	1	20	1	30	52
QUEBEC	0	0	0	0	226	226
PERCENT	25	11	7	34	23	
TOTAL	2126	909	586	2881	1918	8420

Table 2. Nominal landings of white hake from NAFO division 4T broken down by gear and by year. All data from 1983 are provisional.

YEAR::GEAR	TRAWL	SEINE	LINE	GILLNET	OTHER	TOTAL
1972	1140	863	1604	1190	960	5757
1973	2468	211	1045	1265	713	5702
1974	1454	305	345	1100	412	3616
1975	1576	306	324	1285	634	4125
1976	1429	398	183	1147	601	3758
1977	1227	408	231	1300	818	3984
1978	1265	606	419	1689	582	4561
1979	2819	890	469	2337	725	7240
1980	3378	1432	834	4459	1521	11624
1981	4713	1916	660	6142	141	13572
1982	2849	997	977	4317	30	9170
1983	2126	909	586	2881	1918	8420
AVERAGE	2204	770	639	2426	754	6794
PERCENT	32	11	9	35	11	

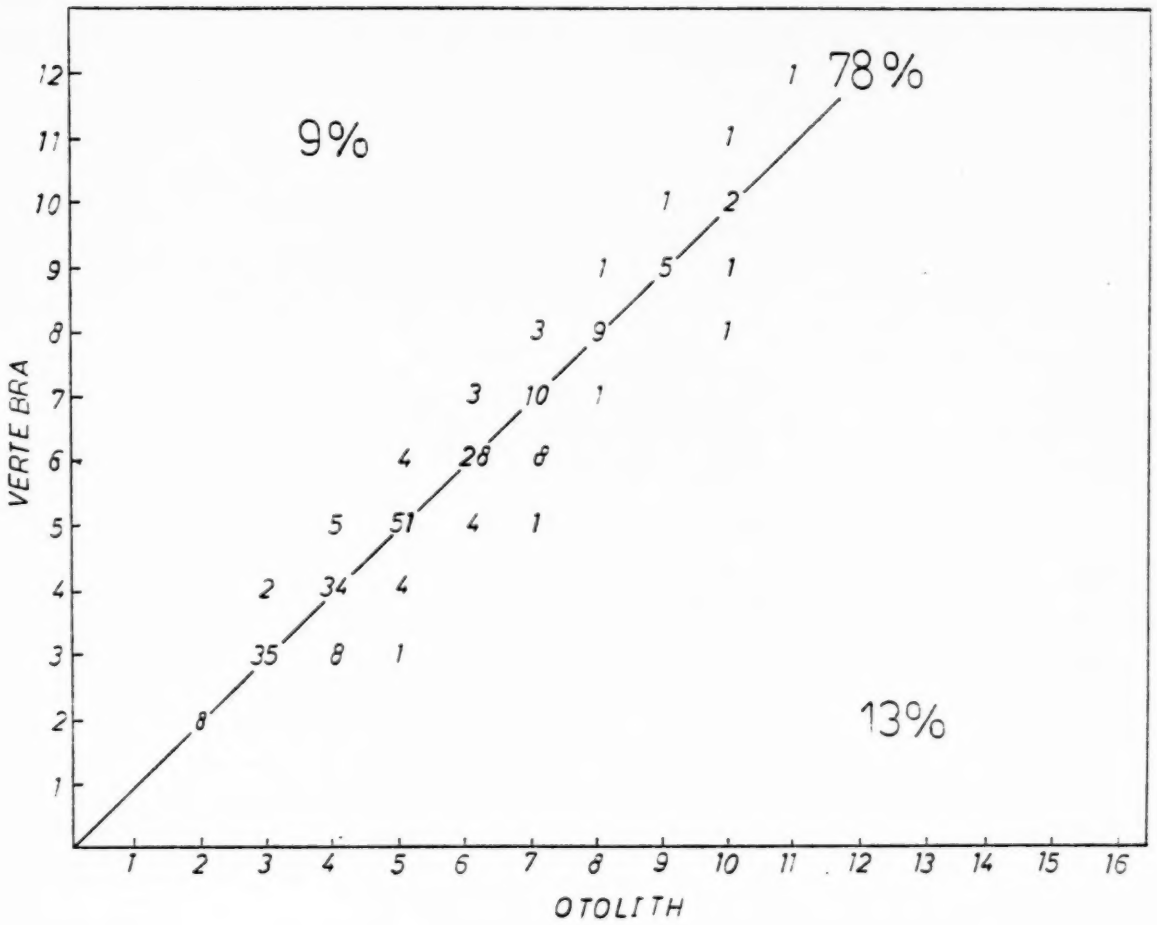

Figure 1. Comparison of number of annuli from vertebrae and otoliths of white hake collected in 1983 from the Gulf of St. Lawrence. The small numbers indicate the actual number of fish while the large numbers are the percent of fish with either equal age estimates (on the line) or age estimates off by one or more years.